On the Performance of Oscillators on G7 Stock Market Indices

NG Wing-kam

A Thesis Submitted in Partial Fulfilment

of the Requirements for the Degree of

Master of Philosophy

in

Economics

August 2003

ABSTRACT

By replicating the methodology of Mills (1997), who found moving average and trading range breakout rules to be profitable on the London Stock Exchange FT30 Index before early 80s, this paper uses two oscillators – Moving Average Convergence-Divergence (MACD) and Relative Strength Index (RSI) – to see if these rules are profitable on the G7 countries stock market indices. Moreover, we will also include transaction costs to see if it will greatly affect the results.

It is found that the performance of trading rules varies across the seven data sets. In the absence of transaction costs, S&P/TSX Composite Index of Canada and FT30 index of the UK contain the largest number of trading rules which outperform the buy-and-hold strategy. DAX 30 and Milan Comit General, on the contrary, contain the greatest number of rules with wrong signals. Among the different time spans of the two oscillators, 21-day RSI (centreline crossover) as well as the 12-day and 26-day combination of MACD (zero line crossover) can generate returns higher than the buy-and-hold strategy in three data sets examined when there is no transaction cost.

There are also three rules generating negative returns in more than two stock market indices. They are the 8-day and 17-day combination of MACD (signal line crossover), 7-day and 14-day RSIs (overbought and oversold zones crossover). When 1 percent transaction cost is taken into account, however, none of the trading rules are concluded to have predictive ability.

摘要

本論文運用Mills(1997)的研究方式，探討兩種震盪值（包括移動平均匯聚背馳指標及相對強弱指數）於七大工業國的股票市場的獲利能力。此外，我們亦考慮交易成本對這兩種震盪值的獲利能力的影響。我們發現移動平均匯聚背馳指標及相對強弱指數的表現在各國有很大的差異，其中以應用於加拿大的S&P/TSX Composite Index指數及英國FT30指數的技術分析表現最好，相對其餘五個國家，這兩個國家有較多指標能給予投資者高於「買進並持有」策略的利潤。而在沒有考慮交易成本的情況下，以21日的相對強弱指數（穿越50）、以及以12日和26日爲短及長天線的移動平均匯聚背馳指標（穿越0）的表現最好，在三個股票市場有高於「買進並持有」策略的利潤。

然而，有部分指標令投資者帶來虧損，包括以8日和17日爲短及長天線的移動平均匯聚背馳指標（穿越信號線）、以及7日及14日相對強弱指數（穿越超買、超賣區），它們均在超過兩個股票市場帶來虧蝕。

但當交易成本因素亦考慮在內時，以上任何一個指標都不能給投資者帶來高於「買進並持有」策略的利潤。

ACKNOWLEGMENTS

Thanks to all people who have made it possible for me to complete the thesis.

I would like to acknowledge and pay special thanks to my supervisor, Professor Chong Tai-leung for his expertise contributed to my paper. Under his guidance, I am able to solve any problem faced. His valuable advices enable me to carry out my research smoothly.

I would also like to thank Professor Kwan Cheuk-chiu and Professor Du Julan for their efforts made on improving my paper. Thanks to Leung Lok-yee, and also Wong Ying-chiu, for their support and technical assistance. I am also grateful to Tsang Heung-chun and Tang Kwong-leung for their helping hands on the day of my seminar. Finally, thanks to all staff members of Department of Economics for their help.

CONTENTS

CHAPTER ONE

INTRODUCTION

Whether technical trading rules can be relied on to make investment decision has long been a controversial issue. If technical trading rules do help investors earn higher profits, it implies that the Efficient Market Hypothesis (EMH), which states that security prices at any time fully reflect all available information, does not hold.

A number of studies have been carried out to examine if technical trading rules are useful. Brock, Lakonishok and LeBaron (1992) test the moving average and trading range breakout rules on Dow Jones Industrial Average. Both statistical and bootstrap methodologies are applied on the trading rules and they conclude that these two rules outperform the buy-and-hold strategy. Mills (1997), who uses the same trading rules as Brock et al. (1992), shows a similar result for the FT30 index, except after early 1980s. Kwon and Kish (2002) test three trading rules (moving average of prices, moving average of prices with momentum, and moving averages of both prices and trading volume) on NYSE value-weighted index using both t-test and bootstrap techniques. These rules are concluded to be able to beat the buy-and-hold strategy in the full sample (1962 – 1996) and all the subperiods, except the last subperiod (1985 – 1996).

Fama (1965), however, finds that the study of historical prices cannot predict future prices. There are also many studies showing that the effectiveness of technical analysis depends on other factors. Neftçi (1991), for example, shows that when economic times series are assumed to be Gaussian, market indicators cannot help predict future prices. Only when prices are non-linear can technical trading rules show some predictability. Treynor and Ferguson (1985) also argue that when the non-price information is taken into account, historical prices can help generate higher profits. Hudson, Dempsey and Keasey (1996) again apply moving averages and trading range breakout rules on FT30 and conclude that these rules are not better than the buy-and-hold strategy under a costly trading environment.

In this paper, we will replicate the methodology used by Mills (1997). However, instead of using moving average and trading range breakout rules tested by Mills (1997), two oscillators will be applied on the same data of Mills (1997) to see if their associate rules are as profitable as moving average and trading range breakout rules. The methodology of Mills (1997) is further applied on six other G7 stock market indices to analyze the performance of the two oscillators across different countries. In addition, transaction costs will be taken into

consideration to see if they significantly reduce the profitability of the trading rules.

The structure of the paper is as follows: Chapter two introduces the data sets and the two trading rules chosen. Chapter three presents the empirical results. Chapter four is the conclusion.

CHPATER TWO

DATA AND TECHNICAL TRADING RULES

DATA

Data sets from the seven industrialized countries are used in this paper. They are the Financial Times – Institute of Actuaries 30 (FT30) index of Mills (1997), which is the longest UK index, CAC 40 of France, Milan Comit General of Italy, S&P/TSX Composite Index of Canada, DAX 30 of Germany, Dow Jones Industrials of the US and Nikkei 225 Stock Average of Japan. The details of the examined periods of each data set are summarized in Table 1. All data were downloaded from Datastream at the Chinese University of Hong Kong.

TABLE 1 HERE

TECHNICAL TRADING RULES

The oscillators examined in this paper are the Moving Average Convergence-Divergence (MACD) and the Relative Strength Index (RSI).

MACD

The MACD is constructed based on moving average. It is calculated by subtracting the longer exponential moving average (EMA) from the shorter EMA. The EMA's formula is as follows:

$$EMA_0 = \frac{1}{N}\sum_{i=1}^{N} P_i, \tag{2.1}$$

$$EMA_t = \left[\frac{2}{N} \times (P_t - EMA_{t-1})\right] + EMA_{t-1}, \tag{2.2}$$

where EMA_t is the exponential moving average at time t, N is the number of periods for EMA, P_t is the value of index at time t. For the first EMA, that is EMA_0, an N-day simple moving average of the stock prices, is used. The formula is based on the computation suggested by Pring (Pring, 2002) and is one of the popular methods to calculate the EMA. A 9-day EMA of MACD, called the signal line, is also calculated to generate buy and sell signals. In this paper, the 12-day EMA and 26-day EMA are investigated. These are the most commonly used short and long periods EMAs (Murphy, 1999). Another two combinations of short and long periods EMAs are suggested by Gerald Appel (Pring, 2002) to identify buy and sell signals. He finds that the use of 8-day EMA, 17-day EMA and signal line does well on generating buy signals, while the 12-day EMA, 25-day EMA accompany with the signal line can be used to identify sell signals. We will apply these two combinations of EMAs to see if there are same findings as Gerald Appel (Pring, 2002) in this paper.

Two methods are adopted to identify buy and sell signals. For the first method, a buy signal is triggered when MACD goes above zero, while a sell signal is triggered when MACD goes below zero. The second method makes use of the signal line, and a buy (sell) signal is triggered when MACD rises above (falls below) the signal line. Throughout this paper, MACD (short EMA, long EMA, 0 or 9) is used to denote the time periods of EMAs and the chosen method for identifying buy and sell signals. The first two figures in the bracket represent the shorter and longer time periods of EMAs respectively, and 0 denotes that the signals are based solely on MACD without using a signal line, while 9 means that a signal line, which is the 9-day EMA of MACD, is also used to generate buy and sell signals.

The computation of MACD is quite similar to the moving average rule applied by Mills (1997). Moving average triggers a buy (sell) signal when the "short" simple moving average, which is the average of security prices, crosses the "long" simple moving average from below (above). MACD, on the other hand, generates a buy (sell) signal when the "short" EMA crosses the "long" EMA from below (above). The only difference between the two trading rules is the choice of moving average. The benefit of using EMA over simple moving average is that we place more weight to the recent prices using EMA. This helps reduce the lag

that is found in simple moving average. This is one of the reasons why MACD is chosen in this paper for testing.

RSI

RSI is an oscillator that is widely used. Its formula is:

$$RSI_t(N) = \frac{\sum_{i=0}^{N-1}(P_{t-i} - P_{t-i-1})1\{P_{t-i} > P_{t-i-1}\}}{\sum_{i=0}^{N-1}|P_{t-i} - P_{t-i-1}|} \times 100, \qquad (2.3)$$

where RSI_t is Relative Strength Index at time t, N is the number of RSI periods, $1\{\cdot\}$ is an indicator function which equals one when the statement inside the bracket is true and equals zero otherwise, |x| is the absolute value of x. The RSI ranges from 0 to 100. A stock is considered as overbought when its RSI is above 70, while it is regarded as oversold when RSI is below 30. The centerline is used to identify whether the market is bullish or bearish. Whenever RSI is above 50, it indicates a bullish signal, while the security is considered to be bearish when RSI is below 50. In this paper, the 7-day, 14-day and 21-day RSIs will be studied. Two methods will be adopted to identify buy and sell signals. The first one makes use of the centerline 50. A buy signal is triggered when RSI crosses the centerline from below, while a sell signal is triggered when RSI crosses the centerline from above. Another way to generate signals makes use of the oversold and overbought zones. When

RSI crosses below oversold zone and rises back above 30 again, there is a buy signal. There is a sell signal when the RSI crosses above the overbought zone 70 and falls back below 70 again.

The use of the above methods, however, may trigger whipsaws, which are some wrong signals. To alleviate this problem, RSI is smoothing up using moving average. This helps reduce the number of whipsaws and allows investors to make better investment decisions. In this paper, 8-day moving average of 9-day RSI (Pring, 2002) will be used.

RSI (period, N-day moving average of RSI, 50 or 30/70) will be used in this paper to denote the time span and the rule used to calculate RSI. The first number inside the bracket denotes the number of days chosen for RSI, the second number indicates if moving average is applied on RSI. It equals zero if moving average is not applicable. The final number is the method of generating signals, with 50 implies the use of centerline crossover and 30/70 denotes oversold and overbought zones crossover.

In this paper, 10-day return is chosen for analysis. According to Brock et al. (1992), the returns in the next few days after the crossing of

moving averages should be different from that before the crossover. Therefore, we focus on the 10-day return after the crossover instead of 1-day return. 10-day return is chosen because it is easier to compare our results with that of Mills (1997). The formula of 10-day return is as follow:

$$\text{10-day return} = \log (P_t + 10) - \log (P_t), \tag{2.4}$$

where P_t is the closing price on day t. Also, whenever there is a buy or sell signal, all other signals during the next ten days are ignored. We will apply the above method throughout the paper.

CHAPTER THREE

EMPIRICAL RESULTS

SAMPLE STATISTICS

Table 2 reports the summary statistics for 10-day returns of G7 stock market indices.

TABLE 2 HERE

The mean values of the 10-day returns of the seven stock market indices range from 0.10 percent (Nikkei 225 Stock Average) to 0.39 percent (Milan Comit General). These are also the returns earned from the buy-and-hold strategy. Negative return equals –0.34 percent is also found in the subperiod 1994 – 2002 of Nikkei 225 Stock Average.

All the seven data sets examined are negatively skewed, except a few subperiods. The indices are also strongly leptokurtic in the whole sample period as well as throughout all subsamples, with the strongest one found in Dow Jones Industrials.

TECHNICAL TRADING RULES (WITHOUT TRANSACTION COST)

All the returns are calculated based on the following investment strategy: when there is a buy signal, the investor borrows and doubles the investment in the index; while a sell signal arrives, the investor sells and invests in a risk-free asset.

Tables 3 to 4 display the 10-day returns and the corresponding t-statistic of the two oscillators. According to Brock et al. (1992),

$$\text{t-statistic for buy or sell} = \frac{\mu_r - \mu}{\sqrt{\frac{\sigma^2}{N} + \frac{\sigma^2}{N_r}}}, \tag{3.1}$$

$$\text{t-statistic for buy} - \text{sell} = \frac{\mu_b - \mu_s}{\sqrt{\frac{\sigma^2}{N_b} + \frac{\sigma^2}{N_s}}}, \tag{3.2}$$

where μ is the mean 10-day return of the whole sample, μ_r is the mean 10-day return of buy or sell signal, N_r is the number of buy or sell signals, while b and s in equation (3.2) represent buy and sell respectively, σ^2 and N are the estimated variances and the number of observations of the sample respectively.

All the results reported are based on the assumption that there is no transaction cost. In the next chapter, transaction costs will be taken into account in analysing the profitability of each trading rule. The

second column "buy" refers to the average 10-day returns generated by the buy signals, while numbers in the "sell" column are average 10-day returns generated by sell signals. The associated t-statistic is found in the parentheses. The fractions of buy signals and sell signals that have positive returns are reported in columns "buy>0" and "sell>0" respectively. The final column is the 10-day returns from a pair of buy and sell signals and is simply the subtraction of the "sell" returns from the "buy" returns.

MACD

MACD(12,26,0)

Two hypotheses are applied in this paper to test the predictability of trading rules. The first hypothesis is that the returns from the trading rules are equal to the returns from the buy-and-hold strategy, while the second hypothesis is related to the equality between the returns from buy and sell signals. Among the various time spans chosen and the two rules used on MACD, the zero crossover of 12-day and 26-day EMAs of MACD is shown to have the greatest predictability. It outperforms the buy-and-hold strategy in three out of the G7 stock market indices (FT30 index, Milan Comit General and S&P/TSX Composite Index).

TABLE 3A HERE

From Table 3A, MACD(12,26,0) is found to have the best performance in FT30 index. All the hypotheses mentioned above are rejected. Since returns in almost all periods (except the return from sell signals in the subperiod between 1955 and 1974) are significant at 5 percent level using two-tailed test, the first hypothesis, that is the equality between returns from market indicators and the buy-and-hold strategy, is rejected.

The second hypothesis, which is the equality between the returns from buy signals and the returns from sell signals, is also rejected. Since all the returns from buy – sell difference are positive, with the corresponding t-ratios significantly reject this null hypothesis, this implies returns from buy signals are not equal to those from sell signals.

In the 60-year sample, the average returns from buy and sell signals are 1.38 percent and -0.68 percent respectively. These returns are substantially larger than the average 10-day return of 0.22 percent from the buy-and-hold strategy. The high predictive ability of this rule in the full sample as well as the three subperiods also implies that the use of MACD(12,26,0) is useful in both long and short time horizons, which

are 60 years and 20 years respectively. Investors can on average earn 5.8 percent (0.679 percent × 3 sell signals + 1.375 percent × 2.7 buy signals) extra return a year by making use of this rule to buy and sell FT30 index.

For Milan Comit General, results similar to FT30 index are found in the full sample and also the second subperiod. In the full sample, since the t-ratio of the buy – sell return is significant at 10 percent level using two-tailed test, it is clear that the second hypothesis of equality between returns from buy and sell signals does not hold. This concludes the effectiveness of MACD(12,26,0) in predicting the future prices of Milan Comit General.

The average 10-day returns from buy signals and sell signals over the period 1976 – 2002 are 1.09 percent and -0.29 percent respectively. These returns are much greater than the return 0.39 percent from the buy-and-hold strategy. On average, there are 2.8 buy signals and 2.9 sell signals a year, therefore, an extra return of 3.9 percent can be earned in one year using this rule.

Returns from the second subperiod, 1985 – 1993 also show sign of predictive power using MACD(12,26,0). Again, the two hypotheses can be rejected at 5 percent level, except the t-ratio of returns from buy

signals. However, the results in first and third subperiods are weaker. None of the returns in these two subperiods are significantly larger than the buy-and-hold strategy. Therefore, investors cannot be benefited if they use MACD(12,26,0) during these two periods.

In the case of S&P/TSX Composite Index, both returns from buy signals and also buy – sell return are highly significant in the entire sample period. In the course of 27 years, MACD(12,26,0) can generate on average an extra return of 3.7 percent to investor every year (3 sell signals ×0.177 percent + 2.7 buy signals × 1.159 percent).

The indicator also works well in the second subperiod, 1985 – 1993. However, during 1976 – 1984 and 1994 – 2002, the use of this rule cannot help investors generate extra profit over the buy-and-hold strategy.

The results in the four other data sets are less satisfactory. None of the null hypothesis mentioned can be rejected. It is obvious that the ability to forecast future stock prices of MACD(12,26,0) is lower in these four countries.

MACD(12,26,9)

TABLE 3B HERE

From Table 3B, MACD(12,26,9) is found to have significant returns in three the data sets (the UK, Germany and Canada). In the UK, the buy – sell difference is significantly positive at 5 percent level in the full sample, while it is significant at 10 percent level in the first subperiod, showing that returns from buy and sell signals are not the same. Therefore, the use of MACD(12,26,9) in FT30 index can give return greater than the buy-and-hold strategy in the course of 60 years and also in the period 1935 – 1954.

However, the performance of this rule is poor in the last two subperiods. During 1955 – 1974 and 1975 – 1994, none of the returns generated can beat the buy-and-hold strategy.

When we compare the performance between MACD(12,26,0) and MACD(12,26,9) using FT30 index, it is found that the predictability of the former rule is much better. It works well in both long and short time horizons. MACD(12,26,9), on the contrary, only generates useful signals in long time horizon and one subperiod.

In Germany, however, the performance of this rule in the full sample is far from satisfactory. The rule is not only unable to earn positive profits greater than the buy-and-hold strategy, they give signals that lead to loss. The buy – sell return is negative, and the corresponding t-statistic shows it is significant at 5 percent level. This implies that whenever investors follow the signals given by MACD(12,26,9), they will suffer loss amounted to 0.94 percent from a pair of buy and sell signals. This is a great loss when compared with the positive buy-and-hold return of 0.25 percent. The negative returns, however, are even greater in the third subperiod. While the buy-and-hold strategy generates positive return of 0.15 percent, investors following this rule suffer loss amounted to 1.79 percent. For the first two subperiods, (1976 – 1984 and 1985 – 1993), there is no negative result which is significant. Buy and sell signals generated by this rule in these two subsamples are concluded to have no predictive power when compared with the buy-and-hold strategy.

Among the seven data sets examined, DAX 30 is one of the data sets that possesses the largest number of trading rules with negative returns. Six out of twelve rules give investors negative returns if they buy and sell DAX 30 using these rules.

In Canada, positive returns larger than the buy-and-hold strategy are found in the second subperiod. For the other periods, none of the returns can beat the buy-and-hold strategy.

For the remaining data sets, MACD(12,26,9) is found to have no predictive ability either in full samples or subsamples. Neither the hypothesis of equality between return from buy or sell signals and buy-and-hold strategy return nor the equality between returns from buy and sell signals can be rejected. Investors therefore cannot benefit from this rule if they trade with CAC 40, Milan Comit General, Dow Jones Industrials or Nikkei 225 Stock Average.

MACD(12,25,9)

As mentioned in section two, the combination of 12-day and 25-day EMAs and the signal line crossover is concluded to be more reliable on generating sell signals according to the suggestion of Gerald Appel (Pring, 2002). However, such benefit is not found in the data sets studied in this paper. It outperforms the buy-and-hold strategy in the UK and Canada, but generates negative returns in Germany. These results are very similar to that of MACD(12,26,9).

TABLE 3C HERE

FT30 index again outperforms the buy-and-hold strategy in the full sample (1935 – 1994) and also the first subperiod (1975 – 1994). Canada is found to have significant positive returns in the second subperiod (1985 – 1993). In Germany, on the contrary, negative returns are found in both full sample and also the third subperiod.

The performance of MACD(12,25,9) in the other five data sets is again very similar to MACD(12,26,9). None of the t-ratios are significant, showing that the signals generated by this rule give investors no extra return.

MACD(8,17,9)

TABLE 3D HERE

MACD(8,17,9) generates negative returns in three countries examined. These include the UK, Italy and Germany.

Although many trading rules examined in this paper work well in FT30 index (half of the trading rules can beat the buy-and-hold strategy), loss is also found using three trading rules. MACD(8,17,9) is one of the

data sets which triggers wrong signals. There is only one subperiod with negative returns in FT30 index. Between 1955 – 1974, the buy – sell returns are negative, with the corresponding t-ratio significant at 10 percent level.

In Germany, MACD(8,17,9) produces sell signals which are significantly positive in the full sample. This implies that investors suffer loss. The buy – sell return is also negative and is significant at 5 percent level.

Milan Comit General is the data set with the second largest number of rules that outperform the buy-and-hold strategy (FT30 index and S&P/TSX Composite Index contain the largest number). However, it is also one of the data sets that contains the largest number of rules with negative returns. Six out of twelve trading rules are concluded to generate negative returns. For MACD(8,17,9), all the t-ratios of returns (except the returns from sell signals) in the full sample are significant at either 5 or 10 percent level. The return from buy signals in the full sample is negative. These indicate that, investors lose money if they use these signals to make investment decision. The first subperiod also shows similar results. In this subperiod, the return from buy-and-hold strategy is only 0.48 percent. However, the loss from a pair of

transactions is as great as 2.09 percent. These results are totally opposite to that suggested by Gerald Appel (Pring, 2002), who found that the combination of 8-day, 17-day EMAs and signal line crossover can generate more reliable buy signals.

RSI

RSI(7,0,50)

TABLE 4A HERE

RSI(7,0,50) is found to generate negative returns in two data sets. (Milan Comit General and CAC 40). But this rule beat the buy-and-hold strategy in the data set S&P/TSX Composite Index.

RSI(7,0,30/70)

TABLE 4B HERE

There are four data sets give negative returns to investors using RSI(7,0,30/70). They are FT30 index, Milan Comit General, S&P/TSX Composite Index and Nikkei 225 Stock Average.

In FT30 index, a significant negative return of 0.73 percent is found from a pair of transactions in the second subperiod. The return from buy signals also significantly negative at 10 percent level.

In Canada, investors suffer loss in the first subperiod. However, no significant positive or negative return is found in the other periods studied.

RSI(7,0,30/70) also generates negative returns which are statistically significant in Milan Comit General in all sample periods, except the last subperiod. The returns from the buy-and-hold strategy are less than 0.5 percent in all the periods examined. However, the smallest loss from RSI(7,0,30/70) is 1.2 percent (in the whole sample period) from a complete transaction.

Investors also suffer loss in Japan in the third subperiod amounted to 1.67 percent. For the other periods, no return generated can outperform the buy-and-hold strategy.

In the other three countries, none of the returns in the full samples are significantly higher than the buy-and-hold strategy. There is also no negative return using this rule in these three data sets.

RSI(14,0,50)

TABLE 4C HERE

RSI(14,0,50) is found to beat the buy-and-hold strategy in FT30 index and Milan Comit General. Table 4C displays the results of RSI(14,0,50) on the G7 stock market indices.

For FT30 index, a buy signal on average generates a 10-day return of 0.78 percent in the whole sample period, while a sell signal generates a return of about -0.13 percent. The buy return is significantly different from the unconditional mean return of 0.22 percent at 5 percent level using two-tailed test, while the sell return is significant at 10 percent level. Based on the above findings, it is obvious that all the hypotheses testing the predictive ability of RSI(14,0,50) in this paper are rejected, showing that this trading rule works well in FT30 index. By using this rule, investors can earn an extra return of 4.5 percent in one year (4.9 buy signals ×0.779 percent + 5.2 sell signals ×0.127 percent).

Returns from each subperiod are less significant than the whole sample period. All the returns from sell signals are insignificant, and thus we are unable to reject the null hypothesis of equality between the

returns of RSI(14,0,50) and the buy-and-hold strategy. Among the three subperiods, 1975 – 1994 generates the highest number of significant returns. The buy return is significant at 10 percent level while the buy – sell returns is significant at 5 percent level. In the subperiod 1935 – 1954, only buy – sell return is significant at 10 percent level, the other two returns are insignificant. Returns in the subperiod 1955 – 1974 are all insignificant. These results differ from Mills (1997), who found moving averages and trading range breakout rules to have lower forecast power when the market is more efficient after early 1980s in FT30 index.

Investors who trade with Milan Comit General can earn an extra return in the second subperiod equals 2.4 percent from a complete transaction.

RSI(14,0,30/70)

TABLE 4D HERE

RSI(14,0,30/70) is another rule concluded to generate wrong signals to investors. Three data sets are found to have negative returns using this rule.

Similar to MACD(8,17,9), investors trading with FT30 index suffer loss in the second subperiod. The first hypothesis of equality between return from buy signals and the buy-and-hold strategy as well as the second hypothesis of equality between returns from buy and sell signals can be rejected at either 5 or 10 percent level.

For Milan Comit General and DAX 30, both full sample and the second subperiod generate negative returns using RSI(14,0,30/70). In Italy, a pair of transactions gives investors negative return of 1.03 percent in the full sample, while it is 0.91 percent in DAX 30.

The loss is even larger in the second subperiod. Both Milan Comit General and DAX 30 generate negative returns larger than 1 percent (1.73 percent and 1.52 percent respectively).

RSI(14,0,30/70), however, outperforms the buy-and-hold strategy in Dow Jones Industrials. A significantly positive return is found in the first subperiod. This trading rule is also the only indicator which can beat the buy-and-hold strategy. For all the other rules, no significant positive or negative return is found.

RSI(21,0,50)

TABLE 4E HERE

RSI(21,0,50) is the second rule which contains the largest number of data sets with returns greater than the buy-and-hold strategy. These include FT30 index, Milan Comit General and S&P/TSX Composite Index.

In the case of FT30 index, RSI(21,0,50) shows a particularly good performance on triggering buy signals. All the returns from buy signals and also the buy – sell differences are significant at either 5 or 10 percent levels regardless the sample size, except the second subperiod 1955 – 1974. However, the performance of sell signals is relatively less satisfactory. None of the returns generated from sell signals can beat the buy-and-hold strategy.

RSI(21,0,50) also displays to have relatively superior results relative to the buy-and-hold strategy in Milan Comit General. The rule works well in both full sample and also the first subperiod, 1976 – 1984. Both the first hypothesis (equality between either returns from buy or sell signals) and the second hypothesis (equality between buy returns and sell returns) can be rejected at either 5 or 10 percent levels. However, the predictability of RSI(21,0,50) decreases in the next two subperiods.

None of the signals emitted by this rule in these two subperiods can give significantly positive returns greater than the buy-and-hold strategy.

For S&P/TSX Composite Index, the buy – sell return is significant at 5 and 10 percent level in the second subperiod and the entire sample period respectively. Therefore, investors can profit from this rule in these two periods.

RSI(21,0,30/70)

TABLE 4F HERE

DAX 30 and Milan Comit General are again the two data sets with negative returns. Loss amounted to 2.27 percent is found in the second subperiod in DAX 30, while wrong signals are generated in the full sample and the first subperiod in Italy.

For the remaining five rules, RSI(7,0,30/70) show to have relatively low predictability. None of the returns are significantly greater than the buy-and-hold strategy.

RSI(9,8,50)

TABLE 4G HERE

FT30 index again gives returns greater than the buy-and-hold strategy. All the returns in the full sample are significant at either 5 or 10 percent levels. The third subperiod, 1975 – 1994 also give significant buy – sell difference. However, the first and second subpeiriods find no support of this trading rule. No significant positive return is generated during these two periods. These results are again different from the ineffectiveness of trading rules after early 1980s concluded by Mills (1997).

RSI(9,8,30/70)

TABLE 4H HERE

There are two data sets with negative returns using RSI(9,8,30/70). They are Milan Comit General and DAX 30. In Italy, trading Milan Comit General using RSI(9,8,30/70) generates a negative return of 1.82 percent from a pair of transactions in the sample 1976 – 2002. In the case of Germany, negative profits are found in 27-year sample and the third subperiod.

In a nutshell, the performance of the technical trading rules examined is not consistent across the data sets chosen and also across the

time spans and rules of each oscillator. That is, the indictors which are concluded to have good performance in one data set do not necessarily imply that they have high predictive ability in other data sets. Also, the performance of oscillators is dependent on the choices of time spans and also the methods that trigger signals. It is found that the centerline crossover of 14-day RSI generates positive returns in two data sets, but overbought and oversold zones crossover of 14-day RSI, on the contrary, generates negative returns in the three data sets.

The predictive power of trading rules also depends on the choice of data sets. Most of the rules which show sign of predictive ability are confined to two indices (S&P/TSX Composite Index and FT30 index). Similar results are concluded for rules which give negative returns. Dow Jones Industrials contains only one rule that can help investors predict future prices. For Nikkei 225 Stock Average, DAX 30 and CAC 40, only two or even fewer rules can beat the buy-and-hold strategy.

Of particular interest is that the findings of FT30 index in this paper are different from that of Mills (1997). Mills demonstrates the existence of more efficient market after the early 1980s accounts for the poor performance of moving average and trading range breakout rules. However, two other forms of trading rules (MACD and RSI) tested on

the same data set do not generate the same results. There are significantly superior returns relative to the buy-and-hold strategy across the entire sample period as well as the three subperiods. RSI(14,0,50), RSI(21,0,50) and RSI(9,8,50), for instance, show to outperform the buy-and-hold strategy after 1980s, but they cannot effectively forecast future prices in the second subperiod, 1955 – 1974. These results are completely different from that found by Mills (1997).

When the centreline crossover as well as the overbought and oversold zones crossover of RSIs are compared, it is found that the performance of centreline line crossover is better. All the time spans chosen with centreline crossover generate returns higher than the buy-and-hold strategy in at least one data set. Investors only suffer loss in France and Germany using centreline crossover of 7-day RSI, while the remaining centreline crossover of RSIs generate either significantly positive returns or returns that are insignificant.

For the overbought and oversold zones crossover, except the first subperiod of Dow Jones Industrials, all the signals triggered by these rules are either wrong signals (negative returns) or useless signals (insignificant returns). These results are obviously worse than that of centerline line crossover of RSIs.

When the distribution of rules with and without forecast power among the different periods is considered, it is found that some periods show to have higher or lower predictability regardless the choice of trading rules. For example, in the FT30 index, all the rules with negative returns concentrate on the second subperiod (1955 – 1974). In Canada, on the contrary, the second subperiod (1985 – 1993) contains the largest number of rules with returns greater than the buy-and-hold strategy. The third subperiod of the same data set, however, contains no rule with predictive power. In Milan Comit General, the negative returns are found only in the whole period and also the first and the second subperiods. All the buy – sell differences generated in the third subperiod are insignificant. The negative returns in DAX 30 concentrate in the entire sample period.

TECHNICAL TRADING RULES (WITH TRANSACTION COST)

The above analysis does not allow any cost to exist when transactions are carried out. However, it is not realistic in the G7 countries. In the case of the UK, we apply the transaction cost suggested by Hudson et al. (1996). According to Hudson et al. (1996), who interviewed stockbrokers and stockbroking divisions of major clearing

banks, the minimum commissions fee is at least 0.1 percent in the UK. When the bid-offer spreads of 0.5 percent and Government stamp duty of 0.5 percent are included, the transaction cost is at least 1 percent. For the other European countries, we also adopt the 1 percent transaction cost. This is also the cost used by Rouwenhorst (1998), who claims that the large and liquid stock markets in Europe results in a relatively low transaction costs of 1 percent or even lower per transaction. In this section, we will focus on the UK and Italy to find out if transaction cost is an important factor affecting the profitability of the trading rules.

Since the number of buy and sell signals are more or less the same for all the trading rules examined, we assume that the risk investors bear is similar to the buy-and-hold strategy.

To deduct the transaction costs from the returns, we use the following method:

$$\frac{\text{Buy - Sell Retrun}}{2} - \text{Transaction Cost (1\%)}, \qquad (3.3)$$

By dividing the buy – sell return by two, we get an average return from one transaction. The 1 percent transaction cost is then subtracted from the average return per transaction to get the profits after the transaction costs.

According to Mills (1997), moving average and trading range breakout rules generate profits higher than the buy-and-hold strategy. However, transaction costs are not considered in his paper. If the 1 percent transaction cost is deducted, the picture will become very different.

Based on the statistics reported by Mills (1997), moving average rule on average generates extra return of 0.0675 percent from a pair of buy and sell signals. That is, for each transaction, investors can on average earn 0.0338 percent over the buy-and-hold strategy. This amount is clearly smaller than the 1 percent transaction cost. When we look further into the subperiod samples, it is found that the existence of 1 percent transaction cost fully eliminates the possible extra returns earned from all the subperiods. Therefore, we conclude that the moving average rule cannot generate return higher than the buy-and-hold strategy when there are transaction costs.

For the trading range breakout rule, the conclusion is similar. The average return from a complete transaction is 0.7621 percent. Therefore, only 0.3811 percent can be earned from one transaction. The returns in the subperiods are also less than 1 percent per transaction. This trading

rule therefore cannot beat the buy-and-hold strategy in the presence of transaction cost.

When we examine the two oscillators applied on the G7 countries, results similar to Mills (1997) are found.

MACD

MACD(12,26,0)

In the UK, it generates a return of 2.053 percent from a pair of buy and sell signals. That is, for each transaction, about 1.027 percent is earned over the buy-and-hold strategy. After the 1 percent of transaction cost is charged, it seems that this rule still allows investor to gain extra return. However, the t-ratio of such positive extra return is not significant at 5 percent level. Therefore, MACD(12,26,0) does not allow investors to earn extra profits when the transaction costs are considered.

In Italy, the return from round-trip transactions is 1.379 percent. Thus, only 0.690 percent return can be earned on average from a single transaction, and is clearly smaller than the 1 percent cost.

Therefore, MACD(12,26,0) cannot produce positive returns after the transaction costs are deducted in any of the countries examined.

RSI

RSI(21,0,50)

With a return from a complete transaction equals 1.185 percent in the UK, the return from a single transaction is negative after the transaction costs 1 percent are imposed.

Milan Comit General generates return of 1.134 percent from one transaction. However, the t-ratio of this positive return is not significant, therefore, investors cannot benefit from this rule after the transaction cost.

For rules which are concluded to generate returns smaller than zero, or have no predictability under an environment without transaction costs, the returns gross of transaction cost are not able to reject the null hypothesis of equality between the returns from the above rules and the buy-and-hold strategy, thus its extra returns net of transaction costs are clearly negative.

Based on the above findings, it is obvious that none of the trading rules can beat the buy-and-hold strategy after the transaction costs are taken into account. This reveals that the extra returns from these trading rules are relatively small and do not have advantage over the buy-and-hold strategy.

CHAPTER FOUR

CONCLUSION AND FURTHER RESEARCH

Previous studies on testing technical trading rules focus on the moving average. In this paper, two other forms of oscillators are studied to see if their associate rules have predictive ability on stock prices. The data set of Mills (1997) and six other G7 countries stock market indices are examined.

In contrast to Mills (1997), who found that moving average and trading range breakout rules have predictive ability on FT30 index when the market is less efficient (before early 1980s), the trading rules examined in this paper do not obtain such results in the presence of transaction costs in the UK and the other six G7 stock market indices.

MACD(12,26,0) and RSI(21,0,50) show some degree of predictive ability among the G7 countries. They give investors returns higher than the buy-and-hold strategy in three of the data sets examined. MACD(8,17,9), RSI(7,0,30/70) and RSI(14,0,30/70), however, give negative returns. Among the seven data sets, FT30 index and S&P/TSX Composite Index are the data sets that have the largest number of rules with profits greater than the buy-and-hold strategy. Six rules generate excess return over the buy-and-hold strategy using these indices. Milan

Comit General contains the second largest number of rules with high predictability, but it is also one of the data sets with the largest number of indicators that contribute loss to investors. It possesses six rules with negative returns.

When the findings of FT30 index in this paper are compared with that of Mills (1997), two different pictures are revealed. While Mills (1997) finds support for moving average and trading range breakout rules during the period when the market was inefficient, i.e. before early 1980s, we do not find such a threshold year in our sample. The last subperiod, which is concluded to have weaker results using technical analysis by Mills (1997), contains four rules with positive returns larger than the buy-and-hold strategy using MACD and RSI in this paper.

The presence of transaction costs also fully eliminates the extra profits generated from all the trading rules, including all the rules applied on FT30 index. The contrasting results between this paper and Mills (1997) reveal the important role played by transaction costs. Whenever the transaction costs are high, the potential profits from trading rules will be fully eliminated and investors will not benefit from technical analysis when compared with the buy-and-hold strategy. However, this is also

attributable to the low extra profits (below 1 percent for most of the rules) generated from the two technical indicators examined.

In this paper, we have applied four different combinations of time spans and signal generating methods to test the performance of MACD. The main reason we choose these four methods is due to their popularity among the securities traders. It is believed that applying other time spans on calculating the MACD will give different results. Therefore, further research can be carried out by testing MACD, and also RSI using other short and long time horizons to see how the performance of these two trading rules varies with the use of different time spans.

TABLES

Table 1: Summary of G7 Stock Market Indices

Stock market index	Country	Whole period	Subperiod
FT30	UK	7/1934-1/1994	1935-1954
			1955-1974
			1975-1994
CAC 40	France	1/1988-12/2002	
Milan Comit General	Italy	1/1976-12/2002	1976-1984
			1985-1993
			1994-2002
S&P/TSX Composite Index	Canada	1/1976-12/2002	1976-1984
			1985-1993
			1994-2002
DAX 30	Germany	1/1976-12/2002	1976-1984
			1985-1993
			1994-2002
Dow Jones Industrials	US	1/1976-12/2002	1976-1984
			1985-1993
			1994-2002
Nikkei 225 Stock Average	Japan	1/1976-12/2002	1976-1984
			1985-1993
			1994-2002

Table 2: Summary Statistics for 10-day Returns of G7

FT30	35-94	35-54	55-74	75-94
Mean	0.00219	0.00123	0.00017	0.00518
S.D.	0.03536	0.02711	0.03374	0.04320
Skewness	-0.22718**	-0.99427**	-0.52513**	0.02679**
Kurtosis	11.74120**	8.45212**	4.98334**	12.55735**
CAC 40	88-02	/	/	/
Mean	0.00306			
S.D.	0.04156			
Skewness	-0.44002**			
Kurtosis	1.72750**			
Milan Comit General	76-02	76-84	85-93	94-02
Mean	0.00390	0.00479	0.00419	0.00275
S.D.	0.04898	0.05043	0.04822	0.04827
Skewness	-0.26120**	-0.13058**	-0.47320**	-0.20169**
Kurtosis	2.28017**	2.89736**	2.20660**	1.63326**
S&P/TSX Composite Index	76-02	76-84	85-93	93-02
Mean	0.00282	0.00383	0.00277	0.00187
S.D.	0.03188	0.03326	0.02857	0.03356
Skewness	-0.93666**	-0.29676**	-2.53886**	-0.55009**
Kurtosis	6.25326**	2.00161**	22.14442**	1.53495**
DAX 30	76-02	76-84	85-93	93-02
Mean	0.00249	0.00169	0.00435	0.00145
S.D.	0.03883	0.02312	0.04141	0.04760
Skewness	-0.83329**	-0.01704	-1.04852**	-0.67549**
Kurtosis	4.70954**	0.30514**	4.76119**	2.65429**
Dow Jones Industrials	76-02	76-84	85-93	93-02
Mean	0.00334	0.00128	0.00509	0.00365
S.D.	0.03218	0.02903	0.03327	0.03392
Skewness	-1.29854**	0.26480**	-3.06895**	-0.63710**
Kurtosis	12.37504**	1.30159**	29.02650**	3.06317**
Nikkei 225 Stock Average	76-02	76-84	85-93	93-02
Mean	0.00096	0.00429	0.00199	-0.00341
S.D.	0.03656	0.02121	0.04179	0.04225
Skewness	-0.22022**	-0.30845**	-0.43284**	0.20865**
Kurtosis	2.50545**	1.31368**	2.79648**	0.51741**

Note: ** indicates that the variable is significant at 5 percent level

Table 3A: Average 10-day Returns from MACD(12,26,0)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	160	181	0.01375**	-0.00679**	0.706	0.459	0.02053**
			(4.111)	(-3.395)			(5.351)
CAC 40	37	54	0.00899	0.00846	0.649	0.537	0.00053
			(0.863)	(0.948)			(0.060)
Milan Comit General	75	79	0.01093	-0.00286	0.667	0.506	0.01379*
			(1.236)	(-1.220)			(1.746)
S&P/TSX Composite Index	72	82	0.01159**	-0.00177	0.694	0.549	0.01335**
			(2.321)	(-1.295)			(2.593)
DAX 30	78	84	0.00404	-0.00008	0.564	0.488	0.00411
			(0.350)	(-0.602)			(0.674)
Dow Jones Industrials	93	104	0.00464	0.00534	0.624	0.615	-0.00070
			(0.386)	(0.628)			(-0.152)
Nikkei 225 Stock Average	78	88	0.00457	0.00485	0.551	0.602	-0.00029
			(0.866)	(0.992)			(-0.050)
First subperiod							
FT30	48	54	0.01418**	-0.01054**	0.833	0.407	0.02472**
			(3.294)	(-3.175)			(4.598)
Milan Comit General	26	26	0.01388	0.00218	0.654	0.615	0.01170
			(0.913)	(-0.263)			(0.836)
S&P/TSX Composite Index	22	24	0.01535	0.00150	0.727	0.5	0.01385
			(1.617)	(-0.341)			(1.411)
DAX 30	30	27	-0.00469	0.00113	0.5	0.481	-0.00582
			(-1.501)	(-0.124)			(-0.949)
Dow Jones Industrials	38	35	0.00263	-0.00119	0.526	0.486	0.00382
			(0.285)	(-0.500)			(0.562)
Nikkei 225 Stock Average	29	32	0.00572	0.00504	0.621	0.594	0.00068
			(0.360)	(0.198)			(0.125)
Second subperiod							
FT30	54	59	0.00982**	-0.00236	0.63	0.492	0.01218*
			(2.093)	(-0.572)			(1.918)
Milan Comit General	23	22	0.02061	-0.01949**	0.783	0.364	0.04010**
			(1.625)	(-2.292)			(2.788)
S&P/TSX Composite Index	28	34	0.01234*	-0.00118	0.679	0.588	0.01353*
			(1.762)	(-0.801)			(1.855)
DAX 30	24	29	0.01215	0.00370	0.583	0.621	0.00845
			(0.918)	(-0.084)			(0.740)
Dow Jones Industrials	28	37	0.00295	0.01170	0.679	0.757	-0.00875
			(-0.338)	(1.198)			(-1.050)
Nikkei 225 Stock Average	22	28	0.00947	0.01073	0.636	0.714	-0.00126
			(0.836)	(1.100)			(-0.106)
Third subperiod							
FT30	58	68	0.01704**	-0.00765**	0.672	0.471	0.02469**
			(2.079)	(-2.432)			(3.197)
Milan Comit General	26	31	-0.00059	0.00471	0.577	0.516	-0.00530
			(-0.351)	(0.225)			(-0.413)
S&P/TSX Composite Index	22	24	0.00687	-0.00586	0.682	0.542	0.01272
			(0.695)	(-1.122)			(1.285)
DAX 30	24	28	0.00683	-0.00515	0.625	0.357	0.01198
			(0.552)	(-0.728)			(0.905)
Dow Jones Industrials	27	32	0.00922	0.00513	0.704	0.594	0.00409
			(0.848)	(0.245)			(0.461)
Nikkei 225 Stock Average	27	28	-0.00067	-0.00124	0.407	0.5	0.00057
			(0.335)	(0.270)			(0.050)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 3B: Average 10-day Returns from MACD(12,26,9)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	352	345	0.00458	-0.00079	0.625	0.493	0.00537**
			(1.252)	(-1.547)			(2.003)
CAC 40	97	94	0.00122	0.00730	0.526	0.606	-0.00608
			(-0.430)	(0.978)			(-1.011)
Milan Comit General	157	164	0.00367	0.00307	0.529	0.561	0.00060
			(-0.058)	(-0.215)			(0.110)
S&P/TSX Composite Index	161	162	0.00254	0.00243	0.522	0.519	0.00011
			(-0.111)	(-0.155)			(0.031)
DAX 30	168	182	-0.00201	0.00743*	0.524	0.593	-0.00944**
			(-1.484)	(1.693)			(-2.272)
Dow Jones Industrials	178	167	-0.00006	0.00436	0.545	0.527	-0.00442
			(-1.390)	(0.405)			(-1.274)
Nikkei 225 Stock Average	175	154	0.00078	-0.00088	0.566	0.513	0.00166
			(-0.064)	(-0.616)			(0.410)
First subperiod							
FT30	113	111	0.00391	-0.00313*	0.673	0.459	0.00704*
			(1.037)	(-1.678)			(1.944)
Milan Comit General	54	50	-0.00324	0.00602	0.426	0.66	-0.00927
			(-1.157)	(0.171)			(-0.936)
S&P/TSX Composite Index	60	52	-0.00080	0.00708	0.5	0.558	-0.00788
			(-1.063)	(0.698)			(-1.250)
DAX 30	54	61	0.00177	0.00395	0.574	0.607	-0.00218
			(0.025)	(0.754)			(-0.505)
Dow Jones Industrials	64	54	-0.00115	-0.00215	0.5	0.389	0.00100
			(-0.660)	(-0.858)			(0.186)
Nikkei 225 Stock Average	54	56	0.00215	0.00365	0.611	0.589	-0.00151
			(-0.732)	(-0.221)			(-0.372)
Second subperiod							
FT30	118	113	0.00322	-0.00249	0.585	0.531	0.00571
			(0.974)	(-0.828)			(1.288)
Milan Comit General	45	63	0.01046	0.00274	0.578	0.540	0.00771
			(0.864)	(-0.234)			(0.819)
S&P/TSX Composite Index	53	51	0.00844	-0.00110	0.585	0.490	0.00954*
			(1.428)	(-0.956)			(1.702)
DAX 30	54	58	0.00243	0.00990	0.537	0.569	-0.00748
			(-0.338)	(1.008)			(-0.955)
Dow Jones Industrials	51	63	0.00288	0.00923	0.549	0.635	-0.00634
			(-0.468)	(0.974)			(-1.012)
Nikkei 225 Stock Average	56	51	0.00479	-0.00281	0.625	0.529	0.00760
			(0.494)	(-0.812)			(0.939)
Third subperiod							
FT30	121	121	0.00653	0.00295	0.62	0.488	0.00357
			(0.339)	(-0.560)			(0.643)
Milan Comit General	58	51	0.00484	0.00056	0.586	0.490	0.00427
			(0.326)	(-0.319)			(0.461)
S&P/TSX Composite Index	48	59	0.00019	0.00137	0.479	0.508	-0.00118
			(-0.343)	(-0.113)			(-0.181)
DAX 30	60	63	-0.00940*	0.00852	0.467	0.603	-0.01792**
			(-1.742)	(1.164)			(-2.087)
Dow Jones Industrials	63	50	-0.00133	0.00526	0.587	0.54	-0.00659
			(-1.148)	(0.332)			(-1.025)
Nikkei 225 Stock Average	65	47	-0.00381	-0.00417	0.477	0.404	0.00036
			(-0.074)	(-0.122)			(0.045)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 3C: Average 10-day Returns from MACD(12,25,9)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	357	345	0.00438	-0.0004	0.613	0.501	0.00478*
			(1.155)	(-1.348)			(1.791)
CAC 40	97	96	0.00155	0.00840	0.536	0.615	-0.00685
			(-0.352)	(1.244)			(-1.144)
Milan Comit General	158	163	0.00412	0.00322	0.532	0.558	0.00091
			(0.106)	(-0.133)			(0.171)
S&P/TSX Composite Index	162	166	0.00281	0.00213	0.525	0.524	0.00068
			(-0.003)	(-0.276)			(0.195)
DAX 30	170	183	-0.00146	0.00681	0.541	0.579	-0.00826**
			(-1.309)	(1.483)			(-1.997)
Dow Jones Industrials	178	168	-0.00015	0.00386	0.545	0.524	-0.00402
			(-1.430)	(0.208)			(-1.161)
Nikkei 225 Stock Average	175	155	0.00077	-0.00082	0.577	0.510	0.00159
			(-0.067)	(-0.600)			(0.395)
First subperiod							
FT30	114	109	0.00407	-0.00305	0.658	0.468	0.00712*
			(1.104)	(-1.631)			(1.959)
Milan Comit General	55	49	-0.00163	0.00719	0.436	0.653	-0.00881
			(-0.921)	(0.388)			(-0.925)
S&P/TSX Composite Index	60	54	-0.00034	0.00708	0.5	0.593	-0.00742
			(-0.958)	(0.711)			(-1.190)
DAX 30	55	61	0.00202	0.00260	0.6	0.590	-0.00058
			(0.106)	(0.304)			(-0.135)
Dow Jones Industrials	63	55	-0.00191	-0.00288	0.492	0.382	0.00097
			(-0.859)	(-1.051)			(0.182)
Nikkei 225 Stock Average	54	56	0.00261	0.00362	0.611	0.589	-0.00101
			(-0.575)	(-0.234)			(-0.249)
Second subperiod							
FT30	121	114	0.00303	-0.00237	0.579	0.535	0.0054
			(0.922)	(-0.795)			(1.227)
Milan Comit General	45	63	0.01044	0.00253	0.578	0.540	0.00791
			(0.912)	(-0.252)			(0.869)
S&P/TSX Composite Index	54	51	0.00874	-0.00148	0.593	0.471	0.01022*
			(1.517)	(-1.052)			(1.833)
DAX 30	54	58	0.00322	0.00903	0.556	0.552	-0.00581
			(-0.198)	(0.849)			(-0.742)
Dow Jones Industrials	51	63	0.00292	0.00930	0.549	0.635	-0.00638
			(-0.460)	(0.992)			(-1.019)
Nikkei 225 Stock Average	56	52	0.00394	-0.00253	0.625	0.519	0.00647
			(0.345)	(-0.771)			(0.804)
Third subperiod							
FT30	122	122	0.00601	0.0038	0.607	0.5	0.00221
			(0.209)	(-0.349)			(0.400)
Milan Comit General	58	51	0.00467	0.00024	0.586	0.490	0.00442
			(0.321)	(-0.358)			(0.487)
S&P/TSX Composite Index	48	61	0.00009	0.00076	0.479	0.508	-0.00067
			(-0.363)	(-0.254)			(-0.104)
DAX 30	61	64	-0.00874*	0.00880	0.475	0.594	-0.01753**
			(-1.649)	(1.218)			(-2.058)
Dow Jones Industrials	64	50	-0.00088	0.00443	0.594	0.54	-0.00531
			(-1.053)	(0.161)			(-0.829)
Nikkei 225 Stock Average	65	47	-0.00349	-0.00422	0.508	0.404	0.00074
			(-0.014)	(-0.131)			(0.091)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 3D: Average 10-day Returns from MACD(8,17,9)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	417	396	0.00068	0.00222	0.54	0.553	-0.00154
			(-0.863)	(0.015)			(-0.621)
CAC 40	105	110	0.00014	0.00483	0.476	0.564	-0.00469
			(-0.709)	(0.441)			(-0.827)
Milan Comit General	194	185	-0.00272*	0.00738	0.448	0.589	-0.01010**
			(-1.857)	(0.953)			(-2.007)
S&P/TSX Composite Index	186	197	0.00424	0.00158	0.575	0.518	0.00266
			(0.599)	(-0.539)			(0.816)
DAX 30	201	190	-0.00143	0.00755*	0.512	0.621	-0.00898**
			(-1.412)	(1.770)			(-2.286)
Dow Jones Industrials	205	194	0.00242	0.00294	0.566	0.593	-0.00051
			(-0.402)	(-0.172)			(-0.160)
Nikkei 225 Stock Average	195	193	-0.00069	0.00022	0.513	0.523	-0.00090
			(-0.620)	(-0.278)			(-0.244)
First subperiod							
FT30	135	127	0.00228	-0.00284*	0.585	0.504	0.00512
			(0.443)	(-1.672)			(1.527)
Milan Comit General	65	63	-0.00733*	0.01357	0.385	0.619	-0.02090**
			(-1.909)	(1.363)			(-2.344)
S&P/TSX Composite Index	69	61	0.00389	0.00169	0.536	0.541	0.00220
			(0.016)	(-0.495)			(0.377)
DAX 30	67	65	-0.00250	0.00383	0.433	0.6	-0.00633
			(-1.461)	(0.736)			(-1.572)
Dow Jones Industrials	72	61	0.00260	-0.00147	0.528	0.508	0.00408
			(0.381)	(-0.731)			(0.807)
Nikkei 225 Stock Average	64	66	0.00460	0.00298	0.609	0.561	0.00162
			(0.118)	(-0.494)			(0.436)
Second subperiod							
FT30	142	130	-0.00356	0.00321	0.5	0.585	-0.00677*
			(-1.300)	(1.016)			(-1.655)
Milan Comit General	62	63	-0.00157	0.00226	0.5	0.571	-0.00383
			(-0.927)	(-0.313)			(-0.444)
S&P/TSX Composite Index	63	64	0.00808	-0.00064	0.619	0.453	0.00872*
			(1.454)	(-0.942)			(1.719)
DAX 30	60	65	0.00059	0.00963	0.55	0.6	-0.00903
			(-0.694)	(1.012)			(-1.218)
Dow Jones Industrials	57	73	0.00526	0.00724	0.579	0.685	-0.00199
			(0.038)	(0.545)			(-0.338)
Nikkei 225 Stock Average	61	64	-0.00144	0.00042	0.525	0.563	-0.00187
			(-0.633)	(-0.296)			(-0.250)
Third subperiod							
FT30	140	139	0.00343	0.00591	0.536	0.568	-0.00248
			(-0.472)	(0.198)			(-0.480)
Milan Comit General	67	59	0.00067	0.00623	0.463	0.576	-0.00556
			(-0.347)	(0.547)			(-0.645)
S&P/TSX Composite Index	54	72	0.00020	0.00346	0.574	0.556	-0.00326
			(-0.361)	(0.395)			(-0.539)
DAX 30	74	60	-0.00211	0.00933	0.554	0.667	-0.01144
			(-0.633)	(1.266)			(-1.384)
Dow Jones Industrials	76	60	0.00012	0.00218	0.592	0.567	-0.00205
			(-0.891)	(-0.332)			(-0.351)
Nikkei 225 Stock Average	70	63	-0.00487	-0.00289	0.414	0.444	-0.00198
			(-0.284)	(0.097)			(-0.270)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 4A: Average 10-day Returns from RSI(7,0,50)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	380	427	0.00190	-0.00013	0.555	0.501	0.00203
			(-0.159)	(-1.336)			(0.812)
CAC 40	113	118	-0.00273	0.00854	0.478	0.576	-0.01127**
			(-1.459)	(1.410)			(-2.059)
Milan Comit General	188	199	-0.00215*	0.00668	0.463	0.558	-0.00884*
			(-1.671)	(0.791)			(-1.774)
S&P/TSX Composite Index	171	216	0.00232	0.00175	0.526	0.528	0.00057
			(-0.203)	(-0.488)			(0.176)
DAX 30	168	224	0.00123	0.00663	0.560	0.589	-0.00541
			(-0.416)	(1.571)			(-1.364)
Dow Jones Industrials	176	231	0.00312	0.00028	0.580	0.528	0.00284
			(-0.089)	(-1.422)			(0.882)
Nikkei 225 Stock Average	182	205	-0.00066	0.00135	0.549	0.556	-0.00201
			(-0.591)	(0.151)			(-0.541)
First subperiod							
FT30	98	142	0.00241	-0.00135	0.633	0.486	0.00376
			(0.423)	(-1.123)			(1.057)
Milan Comit General	69	60	-0.00464	0.01340	0.420	0.667	-0.01804**
			(-1.531)	(1.304)			(-2.027)
S&P/TSX Composite Index	61	64	-0.00008	0.00184	0.443	0.5	-0.00192
			(-0.906)	(-0.472)			(-0.323)
DAX 30	56	77	-0.00138	0.00409	0.5	0.545	-0.00547
			(-0.981)	(0.895)			(-1.347)
Dow Jones Industrials	67	71	0.00320	-0.00287	0.552	0.465	0.00608
			(0.535)	(-1.187)			(1.229)
Nikkei 225 Stock Average	56	71	0.00347	0.00466	0.571	0.648	-0.00119
			(-0.284)	(0.146)			(-0.314)
Second subperiod							
FT30	143	141	-0.00338	0.00094	0.51	0.518	-0.00432
			(-1.230)	(0.280)			(-1.081)
Milan Comit General	52	71	-0.00134	0.00667	0.519	0.535	-0.00802
			(-0.818)	(0.428)			(-0.911)
S&P/TSX Composite Index	60	72	0.00831	-0.00270	0.55	0.5	0.01100**
			(1.481)	(-1.600)			(2.203)
DAX 30	50	77	0.00153	0.01160	0.560	0.636	-0.01007
			(-0.477)	(1.509)			(-1.339)
Dow Jones Industrials	53	81	0.00449	0.00008	0.604	0.519	0.00442
			(-0.129)	(-1.332)			(0.751)
Nikkei 225 Stock Average	50	76	0.00234	0.00221	0.56	0.553	0.00013
			(0.058)	(0.044)			(0.017)
Third subperiod							
FT30	139	144	0.00697	0.00003	0.547	0.5	0.00694
			(0.476)	(-1.415)			(1.351)
Milan Comit General	67	68	-0.00022	0.00077	0.463	0.485	-0.00099
			(-0.496)	(-0.333)			(-0.119)
S&P/TSX Composite Index	50	80	-0.00193	0.00567	0.6	0.575	-0.00760
			(-0.792)	(0.996)			(-1.257)
DAX 30	62	70	0.00335	0.00398	0.613	0.586	-0.00063
			(0.310)	(0.438)			(-0.076)
Dow Jones Industrials	56	79	0.00172	0.00332	0.589	0.595	-0.00160
			(-0.420)	(-0.085)			(-0.270)
Nikkei 225 Stock Average	76	58	-0.00569	-0.00382	0.526	0.448	-0.00186
			(-0.462)	(-0.073)			(-0.253)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 4B: Average 10-day Returns from RSI(7,0,30/70)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	395	508	0.00047	0.00346	0.524	0.549	-0.00299
			(-0.953)	(0.798)			(-1.261)
CAC 40	108	127	0.00203	0.00461	0.546	0.583	-0.00258
			(-0.253)	(0.415)			(-0.474)
Milan Comit General	189	211	-0.00504**	0.00659	0.444	0.545	-0.01163**
			(-2.475)	(0.786)			(-2.371)
S&P/TSX Composite Index	177	232	0.00179	0.00561	0.497	0.569	-0.00382
			(-0.425)	(1.311)			(-1.201)
DAX 30	187	243	0.00226	0.00268	0.540	0.527	-0.00042
			(-0.081)	(0.076)			(-0.112)
Dow Jones Industrials	192	239	0.00574	0.00217	0.557	0.552	0.00357
			(1.018)	(-0.552)			(1.143)
Nikkei 225 Stock Average	187	229	-0.00339	0.00210	0.513	0.559	-0.00549
			(-1.604)	(0.464)			(-1.523)
First subperiod							
FT30	106	164	0.00293	-0.00110	0.557	0.488	0.00403
			(0.636)	(-1.088)			(1.194)
Milan Comit General	67	70	-0.00582*	0.01059	0.388	0.571	-0.01642*
			(-1.698)	(0.947)			(-1.905)
S&P/TSX Composite Index	61	75	-0.00305	0.00703	0.443	0.64	-0.01008*
			(-1.594)	(0.821)			(-1.758)
DAX 30	66	72	0.00259	0.00015	0.470	0.486	0.00244
			(0.314)	(-0.554)			(0.619)
Dow Jones Industrials	66	82	0.00623	0.00043	0.576	0.512	0.00580
			(1.365)	(-0.260)			(1.207)
Nikkei 225 Stock Average	54	84	0.00559	0.00329	0.593	0.595	0.00229
			(0.444)	(-0.422)			(0.620)
Second subperiod							
FT30	148	169	-0.00482*	0.00245	0.480	0.574	-0.00727*
			(-1.762)	(0.878)			(-1.916)
Milan Comit General	62	70	-0.00559	0.00914	0.435	0.6	-0.01473*
			(-1.575)	(0.846)			(-1.751)
S&P/TSX Composite Index	64	75	0.00722	0.00202	0.594	0.44	0.00521
			(1.229)	(-0.226)			(1.071)
DAX 30	63	78	0.00024	0.00242	0.571	0.5	-0.00219
			(-0.778)	(-0.405)			(-0.312)
Dow Jones Industrials	56	83	0.00733	0.00240	0.536	0.578	0.00492
			(0.498)	(-0.722)			(0.856)
Nikkei 225 Stock Average	58	78	0.00295	0.00097	0.603	0.564	0.00197
			(0.172)	(-0.212)			(0.272)
Third subperiod							
FT30	141	175	0.00418	0.00872	0.546	0.583	-0.00454
			(-0.276)	(1.059)			(-0.928)
Milan Comit General	60	71	-0.00360	0.00013	0.517	0.465	-0.00373
			(-1.005)	(-0.450)			(-0.441)
S&P/TSX Composite Index	52	82	0.00077	0.00760	0.442	0.622	-0.00682
			(-0.232)	(1.519)			(-1.147)
DAX 30	58	93	0.00407	0.00486	0.586	0.581	-0.00079
			(0.415)	(0.678)			(-0.099)
Dow Jones Industrials	70	74	0.00400	0.00384	0.557	0.568	0.00017
			(0.086)	(0.047)			(0.029)
Nikkei 225 Stock Average	75	67	-0.01475**	0.00192	0.387	0.507	-0.01666**
			(-2.285)	(1.017)			(-2.346)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 4C: Average 10-day Returns from RSI(14,0,50)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	296	311	0.00779**	-0.00127*	0.622	0.495	0.00906**
			(-2.696)	(-1.709)			(3.154)
CAC 40	78	88	0.01096*	0.00417	0.641	0.534	0.00679
			(1.662)	(0.249)			(1.050)
Milan Comit General	136	129	0.00433	-0.00488**	0.515	0.442	0.00921
			(0.102)	(-2.017)			(1.530)
S&P/TSX Composite Index	128	150	0.00372	0.00069	0.539	0.5	0.00303
			(0.318)	(-0.809)			(0.791)
DAX 30	142	165	0.00427	0.00082	0.542	0.527	0.00345
			(0.540)	(-0.546)			(0.776)
Dow Jones Industrials	145	174	0.00492	0.00318	0.607	0.5	0.00174
			(0.585)	(-0.064)			(0.481)
Nikkei 225 Stock Average	144	163	0.00430	-0.00031	0.597	0.503	0.00461
			(1.084)	(-0.439)			(1.103)
First subperiod							
FT30	86	88	0.00466	-0.00305	0.651	0.432	0.00771*
			(1.161)	(-1.469)			(1.874)
Milan Comit General	46	41	-0.00174	-0.00056	0.457	0.585	-0.00117
			(-0.869)	(-0.674)			(-0.108)
S&P/TSX Composite Index	41	46	0.002	0.000	0.488	0.500	0.002
			(-0.313)	(-0.784)			(0.314)
DAX 30	49	59	-0.00022	-0.00043	0.510	0.492	0.00022
			(-0.570)	(-0.695)			(0.048)
Dow Jones Industrials	51	56	0.00091	-0.00028	0.569	0.464	0.00119
			(-0.091)	(-0.398)			(0.211)
Nikkei 225 Stock Average	44	62	0.00812	0.00475	0.659	0.581	0.00337
			(1.186)	(0.168)			(0.806)
Second subperiod							
FT30	109	106	0.00481	-0.0016	0.587	0.5	0.00641
			(1.424)	(-0.533)			(1.394)
Milan Comit General	43	38	0.00748	-0.01662**	0.535	0.289	0.02409**
			(0.443)	(-2.637)			(2.244)
S&P/TSX Composite Index	45	53	0.00707	0.00066	0.622	0.491	0.00641
			(0.999)	(-0.531)			(1.106)
DAX 30	53	45	0.00773	-0.00237	0.547	0.444	0.01009
			(0.586)	(-1.078)			(1.202)
Dow Jones Industrials	51	58	0.00816	0.00345	0.627	0.517	0.00472
			(0.652)	(-0.371)			(0.738)
Nikkei 225 Stock Average	44	50	0.00310	-0.00148	0.614	0.460	0.00458
			(0.174)	(-0.581)			(0.531)
Third subperiod							
FT30	101	117	0.01367*	0.00036	0.634	0.538	0.01330**
			(1.954)	(-1.192)			(2.267)
Milan Comit General	47	50	0.00739	0.00050	0.553	0.440	0.00690
			(0.653)	(-0.326)			(0.703)
S&P/TSX Composite Index	42	51	0.00164	0.00139	0.5	0.510	0.00025
			(-0.044)	(-0.100)			(0.035)
DAX 30	40	61	0.00518	0.00438	0.575	0.623	0.00080
			(0.492)	(0.476)			(0.082)
Dow Jones Industrials	43	60	0.00584	0.00616	0.628	0.517	-0.00032
			(0.420)	(0.566)			(-0.047)
Nikkei 225 Stock Average	56	51	0.00224	-0.00532	0.536	0.451	0.00756
			(0.988)	(-0.319)			(0.924)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 4D: Average 10-day Returns from RSI(14,0,30/70)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	272	386	-0.00023	0.00300	0.496	0.56	-0.00323
			(-1.118)	(0.444)			(-1.154)
CAC 40	62	91	-0.00383	0.00429	0.435	0.593	-0.00811
			(-1.294)	(0.279)			(-1.186)
Milan Comit General	132	158	-0.00242	0.00783	0.492	0.614	-0.01025*
			(-1.468)	(0.997)			(-1.774)
S&P/TSX Composite Index	127	169	0.00569	0.00175	0.614	0.533	0.00393
			(1.003)	(-0.429)			(1.050)
DAX 30	114	167	0.00135	0.01049**	0.491	0.653	-0.00914*
			(-0.312)	(2.628)			(-1.937)
Dow Jones Industrials	111	164	0.01017**	0.00367	0.658	0.585	0.00650
			(2.217)	(0.128)			(1.643)
Nikkei 225 Stock Average	125	164	-0.00114	-0.00031	0.496	0.518	-0.00083
			(-0.636)	(-0.440)			(-0.191)
First subperiod							
FT30	90	124	0.00160	-0.00087	0.578	0.508	0.00247
			(0.125)	(-0.854)			(0.657)
Milan Comit General	44	54	-0.00342	0.00884	0.455	0.667	-0.01226
			(-1.070)	(0.582)			(-1.197)
S&P/TSX Composite Index	43	55	0.00504	0.00364	0.558	0.582	0.00140
			(0.236)	(-0.043)			(0.207)
DAX 30	38	48	0.00243	0.00624	0.474	0.625	-0.00380
			(0.197)	(1.349)			(-0.758)
Dow Jones Industrials	43	46	0.01028**	-0.00161	0.628	0.5	0.01188*
			(2.013)	(-0.668)			(1.930)
Nikkei 225 Stock Average	33	68	0.00610	0.00050	0.545	0.500	0.00559
			(0.487)	(-1.449)			(1.243)
Second subperiod							
FT30	99	129	-0.00585*	0.00487	0.040	0.612	-0.01071**
			(-1.757)	(1.564)			(-2.378)
Milan Comit General	41	57	-0.00515	0.01214	0.512	0.614	-0.01729*
			(-1.228)	(1.230)			(-1.751)
S&P/TSX Composite Index	43	59	0.01107*	0.00419	0.721	0.492	0.00688
			(1.886)	(0.376)			(1.201)
DAX 30	36	61	-0.00015	0.01503*	0.611	0.672	-0.01518*
			(-0.647)	(1.987)			(-1.744)
Dow Jones Industrials	33	61	0.01932**	0.00774	0.818	0.672	0.01158
			(2.439)	(0.613)			(1.611)
Nikkei 225 Stock Average	38	58	-0.00467	0.00210	0.500	0.603	-0.00677
			(-0.975)	(0.019)			(-0.776)
Third subperiod							
FT30	83	133	0.00450	0.00480	0.518	0.556	-0.00031
			(-0.143)	(-0.100)			(-0.051)
Milan Comit General	47	47	0.00089	0.00144	0.511	0.553	-0.00054
			(-0.260)	(-0.184)			(-0.055)
S&P/TSX Composite Index	41	55	0.00072	-0.00274	0.561	0.527	0.00346
			(-0.217)	(-1.005)			(0.499)
DAX 30	40	58	0.00166	0.00922	0.4	0.655	-0.00756
			(0.028)	(1.228)			(-0.773)
Dow Jones Industrials	35	57	0.00140	0.00357	0.543	0.561	-0.00216
			(-0.389)	(-0.018)			(-0.297)
Nikkei 225 Stock Average	54	38	-0.00308	-0.00546	0.463	0.421	0.00238
			(0.057)	(-0.296)			(0.266)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 4E: Average 10-day Returns from RSI(21,0,50)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	226	257	0.01145**	-0.00041	0.668	0.51	0.01185**
			(3.905)	(-1.168)			(3.676)
CAC 40	58	81	0.00478	0.00692	0.603	0.580	-0.00214
			(0.313)	(0.827)			(-0.299)
Milan Comit General	111	104	0.01200*	-0.01069**	0.613	0.404	0.02268**
			(1.728)	(-3.014)			(3.394)
S&P/TSX Composite Index	119	111	0.00614	-0.00271*	0.546	0.450	0.00885*
			(1.127)	(-1.813)			(2.105)
DAX 30	118	126	0.00455	0.00178	0.576	0.524	0.00278
			(0.572)	(-0.204)			(0.558)
Dow Jones Industrials	119	146	0.00287	0.00153	0.597	0.541	0.00134
			(-0.160)	(-0.674)			(0.337)
Nikkei 225 Stock Average	122	121	0.00016	-0.00055	0.525	0.479	0.00071
			(-0.239)	(-0.449)			(0.151)
First subperiod							
FT30	66	75	0.01082**	-0.00356	0.773	0.48	0.01438**
			(2.852)	(-1.522)			(-3.143)
Milan Comit General	37	31	0.02545**	-0.01579**	0.676	0.419	0.04124**
			(2.470)	(-2.257)			(3.358)
S&P/TSX Composite Index	37	35	0.00848	-0.00321	0.486	0.371	0.01169
			(0.844)	(-1.242)			(1.491)
DAX 30	44	41	0.00195	-0.00062	0.523	0.488	0.00257
			(0.074)	(-0.633)			(0.511)
Dow Jones Industrials	47	49	-0.00191	0.00014	0.596	0.531	-0.00205
			(-0.745)	(-0.272)			(-0.345)
Nikkei 225 Stock Average	34	48	0.00829	0.00239	0.618	0.542	0.00591
			(1.092)	(-0.615)			(1.242)
Second subperiod							
FT30	82	83	0.00626	-0.0001	0.598	0.506	0.00636
			(1.630)	(-0.065)			(1.212)
Milan Comit General	37	31	-0.00016	-0.01185*	0.541	0.290	0.01169
			(-0.544)	(-1.839)			(0.995)
S&P/TSX Composite Index	43	41	0.00999	-0.00346	0.628	0.488	0.01345**
			(1.642)	(-1.384)			(2.157)
DAX 30	38	41	0.01225	0.00653	0.632	0.561	0.00572
			(1.166)	(0.334)			(0.613)
Dow Jones Industrials	34	54	0.00295	0.00568	0.559	0.611	-0.00274
			(-0.372)	(0.130)			(-0.376)
Nikkei 225 Stock Average	40	33	-0.00412	0.00319	0.4	0.515	-0.00731
			(-0.917)	(0.164)			(-0.744)
Third subperiod							
FT30	78	99	0.01743**	0.00173	0.654	0.535	0.01571**
			(2.482)	(-0.792)			(2.401)
Milan Comit General	37	42	0.01071	-0.00606	0.622	0.476	0.01677
			(0.996)	(-1.172)			(1.541)
S&P/TSX Composite Index	39	35	-0.00032	-0.00134	0.513	0.486	0.00102
			(-0.404)	(-0.561)			(0.130)
DAX 30	36	44	-0.00039	-0.00042	0.583	0.523	0.00004
			(-0.229)	(-0.258)			(0.003)
Dow Jones Industrials	38	43	0.00870	-0.00211	0.632	0.465	0.01080
			(0.909)	(-1.103)			(1.431)
Nikkei 225 Stock Average	48	40	-0.00203	-0.00715	0.563	0.375	0.00512
			(0.223)	(-0.555)			(0.566)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 4F: Average 10-day Returns from RSI(21,0,30/70)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	193	280	-0.00022	-0.00028	0.539	0.511	0.00006
			(-0.940)	(-1.158)			(0.018)
CAC 40	35	62	-0.00709	-0.00114	0.457	0.516	-0.00595
			(-1.437)	(-0.789)			(-0.677)
Milan Comit General	93	127	-0.00842**	0.00424	0.398	0.559	-0.01266*
			(-2.410)	(0.077)			(-1.894)
S&P/TSX Composite Index	74	127	0.00074	-0.00076	0.541	0.520	0.00150
			(-0.558)	(-1.254)			(0.322)
DAX 30	66	113	-0.00415	0.00409	0.470	0.584	-0.00824
			(-1.383)	(0.435)			(-1.370)
Dow Jones Industrials	60	110	0.00085	0.00386	0.5	0.609	-0.00301
			(-0.598)	(0.166)			(-0.583)
Nikkei 225 Stock Average	70	118	-0.00366	0.00351	0.514	0.559	-0.00717
			(-1.052)	(0.752)			(-1.301)
First subperiod							
FT30	67	106	0.00399	-0.00206	0.612	0.5	0.00605
			(0.824)	(-1.241)			(1.430)
Milan Comit General	33	40	-0.01730**	0.00722	0.333	0.6	-0.02452**
			(-2.498)	(0.301)			(-2.068)
S&P/TSX Composite Index	27	42	-0.00288	-0.00098	0.519	0.548	-0.00189
			(-1.041)	(-0.929)			(-0.231)
DAX 30	25	30	0.00415	0.00481	0.560	0.633	-0.00066
			(0.530)	(0.736)			(-0.106)
Dow Jones Industrials	26	32	0.00452	0.00323	0.385	0.656	0.00129
			(0.567)	(0.378)			(0.168)
Nikkei 225 Stock Average	20	49	0.01015	0.00224	0.7	0.531	0.00791
			(1.230)	(-0.668)			(1.405)
Second subperiod							
FT30	72	87	-0.00668*	0.00206	0.486	0.517	-0.00874
			(-1.704)	(0.527)			(-1.627)
Milan Comit General	34	46	-0.00272	0.00456	0.412	0.565	-0.00729
			(-0.829)	(0.053)			(-0.668)
S&P/TSX Composite Index	26	39	0.00461	-0.00116	0.577	0.462	0.00577
			(0.326)	(-0.852)			(0.797)
DAX 30	21	47	-0.01377**	0.00893	0.429	0.596	-0.02270**
			(-1.996)	(0.750)			(-2.088)
Dow Jones Industrials	15	38	0.00507	0.00615	0.667	0.605	-0.00108
			(-0.002)	(0.196)			(-0.107)
Nikkei 225 Stock Average	21	44	-0.00252	0.00613	0.524	0.568	-0.00865
			(-0.492)	(0.651)			(-0.780)
Third subperiod							
FT30	54	87	0.00318	-0.00044	0.519	0.517	0.00362
			(-0.341)	(-1.207)			(0.484)
Milan Comit General	26	41	-0.00461	0.00096	0.462	0.512	-0.00557
			(-0.773)	(-0.235)			(-0.460)
S&P/TSX Composite Index	21	46	0.00060	-0.00022	0.524	0.543	0.00082
			(-0.173)	(-0.418)			(0.093)
DAX 30	20	36	-0.00442	-0.00283	0.4	0.528	-0.00160
			(-0.549)	(-0.534)			(-0.120)
Dow Jones Industrials	19	40	-0.00752	0.00217	0.526	0.575	-0.00969
			(-1.430)	(-0.273)			(-1.026)
Nikkei 225 Stock Average	29	25	-0.01401	0.00139	0.379	0.6	-0.01540
			(-1.343)	(0.565)			(-1.336)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 4G: Average 10-day Returns from RSI(9,8,50)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	273	315	0.00713**	-0.00114*	0.575	0.505	0.00828**
			(2.287)	(-1.657)			(2.830)
CAC 40	67	91	0.01144	0.00520	0.627	0.549	0.00624
			(1.636)	(0.486)			(0.932)
Milan Comit General	130	142	0.00474	0.00115	0.569	0.507	0.00359
			(0.193)	(-0.662)			(0.603)
S&P/TSX Composite Index	134	141	0.00212	0.00077	0.515	0.489	0.00135
			(-0.252)	(-0.755)			(0.350)
DAX 30	137	155	0.00016	-0.00165	0.540	0.497	0.00181
			(-0.696)	(-1.312)			(0.397)
Dow Jones Industrials	135	159	0.00316	0.00372	0.563	0.566	-0.00056
			(-0.065)	(0.145)			(-0.148)
Nikkei 225 Stock Average	125	157	0.00433	0.00096	0.576	0.561	0.00337
			(1.021)	(-0.001)			(0.769)
First subperiod							
FT30	79	102	0.00448	0.00047	0.620	0.510	0.00402
			(1.054)	(-0.286)			(0.989)
Milan Comit General	44	48	0.00232	0.00852	0.545	0.625	-0.00620
			(-0.322)	(0.507)			(-0.589)
S&P/TSX Composite Index	46	46	0.00248	0.00784	0.457	0.587	-0.00537
			(-0.273)	(0.810)			(-0.774)
DAX 30	49	57	-0.00195	0.00249	0.531	0.544	-0.00443
			(-1.089)	(0.257)			(-0.984)
Dow Jones Industrials	52	53	-0.00121	0.00185	0.5	0.491	-0.00307
			(-0.612)	(0.142)			(-0.541)
Nikkei 225 Stock Average	35	62	0.00724	0.00427	0.714	0.661	0.00297
			(0.818)	(-0.005)			(0.662)
Second subperiod							
FT30	93	105	0.00467	-0.00279	0.559	0.476	0.00746
			(1.285)	(-0.879)			(1.554)
Milan Comit General	43	43	0.00659	-0.00896*	0.581	0.395	0.01555
			(0.324)	(-1.770)			(1.495)
S&P/TSX Composite Index	49	49	0.00169	-0.00242	0.531	0.469	0.00410
			(-0.263)	(-1.258)			(0.711)
DAX 30	47	44	0.00380	-0.00498	0.553	0.432	0.00878
			(-0.090)	(-1.480)			(1.011)
Dow Jones Industrials	42	58	0.00593	0.00452	0.571	0.603	0.00141
			(0.161)	(-0.129)			(0.209)
Nikkei 225 Stock Average	38	48	0.00876	-0.00188	0.605	0.479	0.01064
			(0.989)	(-0.635)			(1.172)
Third subperiod							
FT30	101	108	0.01147	-0.00107	0.554	0.528	0.01254**
			(1.444)	(-1.491)			(2.096)
Milan Comit General	43	51	0.00536	0.00273	0.581	0.490	0.00262
			(0.351)	(-0.002)			(0.262)
S&P/TSX Composite Index	39	46	0.00224	-0.00290	0.564	0.413	0.00514
			(0.069)	(-0.954)			(0.704)
DAX 30	41	54	-0.00150	-0.00330	0.537	0.5	0.00180
			(-0.393)	(-0.724)			(0.182)
Dow Jones Industrials	41	48	0.00587	0.00480	0.634	0.604	0.00107
			(0.415)	(0.233)			(0.148)
Nikkei 225 Stock Average	52	47	-0.00087	-0.00052	0.462	0.511	-0.00035
			(0.428)	(0.464)			(-0.041)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

Table 4H: Average 10-day Returns from RSI(9,8,30/70)

Whole period	N(Buy)	N(Sell)	Buy	Sell	Buy>0	Sell>0	Buy-Sell
FT30	240	322	0.0017	0.00244	0.567	0.553	-0.00074
			(-0.214)	(0.123)			(-0.244)
CAC 40	47	79	0.00000	0.00492	0.426	0.519	-0.00492
			(-0.501)	(0.393)			(-0.642)
Milan Comit General	121	144	-0.00575**	0.01246**	0.430	0.583	-0.01821**
			(-2.148)	(2.075)			(-3.015)
S&P/TSX Composite Index	108	155	-0.00024	0.00185	0.537	0.555	-0.00209
			(-0.990)	(-0.374)			(-0.524)
DAX 30	93	138	-0.00661**	0.00631	0.452	0.558	-0.01292**
			(-2.245)	(1.144)			(-2.480)
Dow Jones Industrials	90	144	0.00398	0.00332	0.611	0.549	0.00066
			(0.189)	(-0.007)			(0.154)
Nikkei 225 Stock Average	104	140	0.00183	-0.00034	0.529	0.5	0.00217
			(0.242)	(-0.415)			(0.459)
First subperiod							
FT30	79	119	0.00054	0.00116	0.646	0.571	-0.00061
			(-0.228)	(-0.034)			(-0.156)
Milan Comit General	42	48	-0.00983*	0.01434	0.333	0.646	-0.02417**
			(-1.862)	(1.297)			(-2.268)
S&P/TSX Composite Index	42	53	-0.00362	0.00501	0.429	0.585	-0.00863
			(-1.439)	(0.256)			(-1.256)
DAX 30	34	39	-0.00024	0.00587	0.441	0.513	-0.00611
			(-0.481)	(1.121)			(-1.127)
Dow Jones Industrials	41	41	0.00432	0.00297	0.512	0.537	0.00135
			(0.665)	(0.370)			(0.211)
Nikkei 225 Stock Average	30	57	0.00603	0.00148	0.6	0.509	0.00455
			(0.446)	(-0.988)			(0.951)
Second subperiod							
FT30	84	99	-0.00546	0.00214	0.488	0.525	-0.00759
			(-1.508)	(0.584)			(-1.518)
Milan Comit General	39	50	0.00175	0.01544	0.487	0.62	-0.01369
			(-0.313)	(1.631)			(-1.329)
S&P/TSX Composite Index	32	54	0.00706	0.00108	0.625	0.537	0.00598
			(0.843)	(-0.430)			(0.938)
DAX 30	30	47	-0.00681	0.00737	0.5	0.511	-0.01418
			(-1.467)	(0.494)			(-1.465)
Dow Jones Industrials	23	53	0.01252	0.00359	0.696	0.566	0.00893
			(1.065)	(-0.325)			(1.075)
Nikkei 225 Stock Average	35	50	-0.00014	-0.00055	0.486	0.46	0.00041
			(-0.300)	(-0.425)			(0.044)
Third subperiod							
FT30	77	104	0.01069	0.00419	0.571	0.558	0.00651
			(1.108)	(-0.237)			(1.002)
Milan Comit General	40	46	-0.00878	0.00727	0.475	0.478	-0.01604
			(-1.497)	(0.629)			(-1.537)
S&P/TSX Composite Index	34	48	-0.00293	-0.00077	0.588	0.542	-0.00216
			(-0.828)	(-0.539)			(-0.288)
DAX 30	29	52	-0.01388*	0.00568	0.414	0.635	-0.01956*
			(-1.723)	(0.635)			(-1.773)
Dow Jones Industrials	26	50	-0.00409	0.00333	0.692	0.54	-0.00742
			(-1.158)	(-0.067)			(-0.905)
Nikkei 225 Stock Average	39	33	0.00038	-0.00315	0.513	0.545	0.00353
			(0.556)	(0.035)			(0.353)

Note: ** indicates that the variable is significant at 5 percent level

*indicates that the variable is significant at 10 percent level

BIBLOGRAPHY

Brock, W., J. Lakonishok, and B. LeBaron, (1992), "Simple technical trading rules and the stochastic properties of stock returns," *Journal of Finance* 5, 1731-1764.

Hudson, R., M. Dempsey, K. Keasey, 1996, "A note on the weak form efficiency of capital markets: The application of simple technical trading rules to UK stock prices – 1935 to 1994," *Journal of Banking and Finance* 20, 1121-1132.

Fama, E.F., 1965, "The behavior of stock-market prices," *Journal of Business* 38, 34-105.

Kwon, K.Y., R. J. Kish, 2002, "Technical trading strategies and return predictability: NYSE", *Applied Financial Economics* 12, 639-653.

Meyers, Thomas A., *The Technical Analysis Course: A Winning Program for Stock & Future Traders & Investors*, Probus Pub. Co., Chicago.

Mills, T.C., 1997, "Technical analysis and the London Stock Exchange: Testing trading rules using the FT30," *International Journal of Finance and Economics* 2, 319-331.

Murphy, J.J., 1999, *Technical Analysis of the Financial Markets: A Comprehensive Guide to Trading Methods and Applications*, New York Institute of Finance.

Neftçi, S.N., 1991, "Naïve trading rules in financial markets and Wiener-Kolmogorov prediction theory: A study of "technical analysis", *Journal of Business* 64, 549-571.

Pring, M.J., 1999, *Technical Analysis Explained: The Successful Investor's Guide to Spotting Investment Trends and Turning Points*, McGraw-Hill, New York.

Pring, M.J., 2002, *Momentum Explained Volume 1*, McGraw-Hill, New York.

Pring, M.J., 2002, *Momentum Explained Volume 2*, McGraw-Hill, New York

Ratner, M., R.P.C. Leal, 1999, "Tests of technical trading strategies in the emerging equity market in Latin America and Asia," *Journal of Banking and Finance* 23, 1887-1905.

Rouwenhorst, K.G., 1998, "International momentum strategies," *The Journal of Finance* 53, 267-284.

Schwager, J.C., 1996, *Technical Analysis*, Wiley, New York.

Treynor, J.L., R. Ferguson, 1985, "In defense of technical analysis," *Journal of Finance* 40, 757-773.